

Date: Tuesday, 1/15/2008 3:08:13 PM
User: Kim Johnston

Process Sheet

Customer : CU-DAR001 Dart Helicopters Services Drawing Name : 412 X-TUBE ,LOW NARROW AFT
Job Number : 36769
Estimate Number : 13020
P.O. Number :
This Issue : 1/15/2008 S.O. No. :
Prsht Rev. : NC Part Number : D412664209
First Issue : 1/15/2008 Type : LANDING GEAR Drawing Number : D412-664-209 UR A
Previous Run : 36768 Drawing Revision : UR A
Written By :
Checked & Approved By :
Comment : Est Rev:A New Issue 07.09.12 EC verified by: JLM
Est Rev:B ECN 1100 08-01-11 DD verified by EC

Additional Product

Job Number:



Seq. #: Machine Or Operation: Description :

1.0 DC DOCUMENT CONTROL



Comment: DOCUMENT CONTROL

Photocopy bluefile and create labels as per PPP D212-664-209 CHG001

2.0 D6008132P Crosstube extrusion



Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)

Pick:

Qty Part number Description Batch

1 D6008-132 Crosstube

Check OD = 3.250"; ID = 2.375"

3.0 MORI SEIKI MORI SEIKI CNC LATHE LARGE



Comment: 1-TURN AS PER FOLIO FA708 & DWG D412-664-249,

FOLIO REV: AA

DWG REV: A

2-DEBURR AS REQUIRED

4.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

5.0 QC8 SECOND CHECK



Comment: SECOND CHECK

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

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Job Number: 36769

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Polish entire outside surface of crosstube

8-1-22

7.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

DP 8-1-22

8.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

8-1-22 (1)

9.0

QC3/5

INSPECT WORK/WING WALK



Comment: Inspect work & Chemical conversion Coat

08-01-22 (1)

10.0

BENDING

BENDING MACHINE



Comment: BENDING MACHINE

Bend tube as per Dwg D412-664-249 using CNC bender program and Folio FT

EL/JO 8-1-24

11.0

QC15

DIMENSIONAL CHECK



Comment: DIMENSIONAL CHECK

08-01-24 (Pb) (1)

12.0

D36601

CUFF



Comment: Qty: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)

CUFF

Batch:

B36651 DP 8-1-25

13.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Drill Rivet holes as per Dwg D412-664-249

2-Drill pilot holes in tube as per Dwg D412-664-249

3-Ream hole to finish size in tube as per Dwg D412-664-249

4-cut to height EL/JO

DP 8-1-25

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
08/01/25	# 11.1	cut x-tube to correct height as per Dwg. D412-664-249	EZ	8-1-25		<i>[Signature]</i> 08/01/25	<i>[Signature]</i> 08/01/25	
08/01/25	# 11.2	inspect height after cutting ex #15. <i>permet change</i>					<i>[Signature]</i> 08/01/25	

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____
 QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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Drawing Name: 412 X-TUBE LOW NARROW AFT

Job Number: 36769

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description:

4-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-249

Job 8-1-28

14.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat Tube & Cuffs as per QSI 005 4.1

Job 8-1-28

15.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

08/01/31 (20)

16.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

08/01/31 (20)

17.0

OUTSIDE SERV.10

OUTSIDE SERVICES -LG



Comment: Sub-Contracting OUTSIDE SERVICES

Liquid Penetrant Inspection as per QSI 038

Issue P/O: 5590 LPI as per ASTM 1417

Level 2 Attach copy of NDT results to work order

08/02/04 (1)

18.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Inspect for transit damage

Ensure copy of NDT results attached to work order.

08/02/04 (1)

19.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: Inspect for damage & ensure results are as per Dwg D412-664-203

08/02/04 (1)

20.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Rivet Cuffs as per Dwg D412-664-249. with Sika flex in Between tube & Cuff

A/R SIKAFLEX -241/-291

BATCH:

M 105438

Exp M 8-7-30

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

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Drawing Name: 412 X-TUBE LOW NARROW AFT

Job Number: 36769

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description:

21.0

CR3212407

CHERRY RIVET



Comment: Qty.: 44.0000 Each(s)/Unit Total: 44.0000 Each(s)

CHERRY RIVET

Batch: M 104071

(92)

M

8-2-5

22.0

SPRAY PAINTING

SPRAY PAINTING



Comment: SPRAY PAINTING

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per QSI 005 4.2

BT 08-02-05

23.0

QC14

INSPECT SPRAY PAINT



Comment: Inspect Spray Paint

Wrap in plastic bag to protect from scratches

M 08/02/06

(1)

24.0

D28961

Support



Comment: Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

Support

Batch: 30200

BT 08-02-06

25.0

D31891

Chafing Shield



Comment: Qty.: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)

Chafing Shield

Batch: 36065

BT 08-02-06

26.0

D3595

Rubber Cushion (per sq ft)



Comment: Qty.: 0.0263 sf(s)/Unit Total: 0.0263 sf(s)

Rubber Cushion

Cut to .630" X 5.70" Qty 2

Batch: 35126

BT 08-02-06

27.0

MS2192028

Clamp(per MIL-DTL-8783C)



Comment: Qty.: 4.0000 Each(s)/Unit Total: 4.0000 Each(s)

Clamp

Batch: 104423

BT 08-02-06

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

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Drawing Name: 412 X-TUBE ,LOW NARROW AFT

Job Number: 36769

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description :

28.0

MS2192030

clamp(per MIL-DTL-8783C)



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)
clamp(per MIL-DTL-8783C) B 106810

27 08-02-06

29.0

D28566001009

Abrasion strip



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)
Abrasion strip
batch 36398

27 08-02-06

30.0

AN640A

Bolt



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)
Bolt
batch M106516

AS 08/02/13

(X)

31.0

AN641A

Bolt



Comment: Qty.: 2.0000 Each(s)/Unit Total : 2.0000 Each(s)
Bolt
M104427

AS 08/02/13

(X)

32.0

MS21042L6

Nut



Comment: Qty.: 6.0000 Each(s)/Unit Total : 6.0000 Each(s)
Nut
batch M104374

AS 08/02/13

(X)

33.0

AN960JD616

Washer



Comment: Qty.: 18.0000 Each(s)/Unit Total : 18.0000 Each(s)
Washer
batch M106883

AS 08/02/13

(X)

34.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1
Assemble as per Dwg D412-664-249

Instal support with magnobond 6398 per dwg D412-664-249,
cure for 12hrs before packaging.

Magnabond

B 106695

27 08-02-06

Time & date of application: 5:00

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
08/02/07	29.1	QC inspection level 45 inspect work to current step	J	08/02/07	(4)			

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes ☒ No ☐ DQA: ☒ Date: 08/02/07
 QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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NOTE: Date & initial all entries

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Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: 412 X-TUBE ,LOW NARROW AFT

Job Number: 36769

Part Number: D412664209

Job Number:



Seq. #:

Machine Or Operation:

Description :

Batch: _____

35.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

08/01/13 (X)

36.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Identify and pack for shipping as per PPP D412-664-209

Rev draft

8/2/13 SQ (X)

37.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

08/02/13

Job Completion



2008/2/26 (1)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	36769
Description: Crosstube Assembly (412 Low Aft)		Part Number:	D412-664-249
Inspection Dwg: D412-664-249 Rev: A		Page 1 of 1	

FIRST ARTICLE INSPECTION CHECKLIST

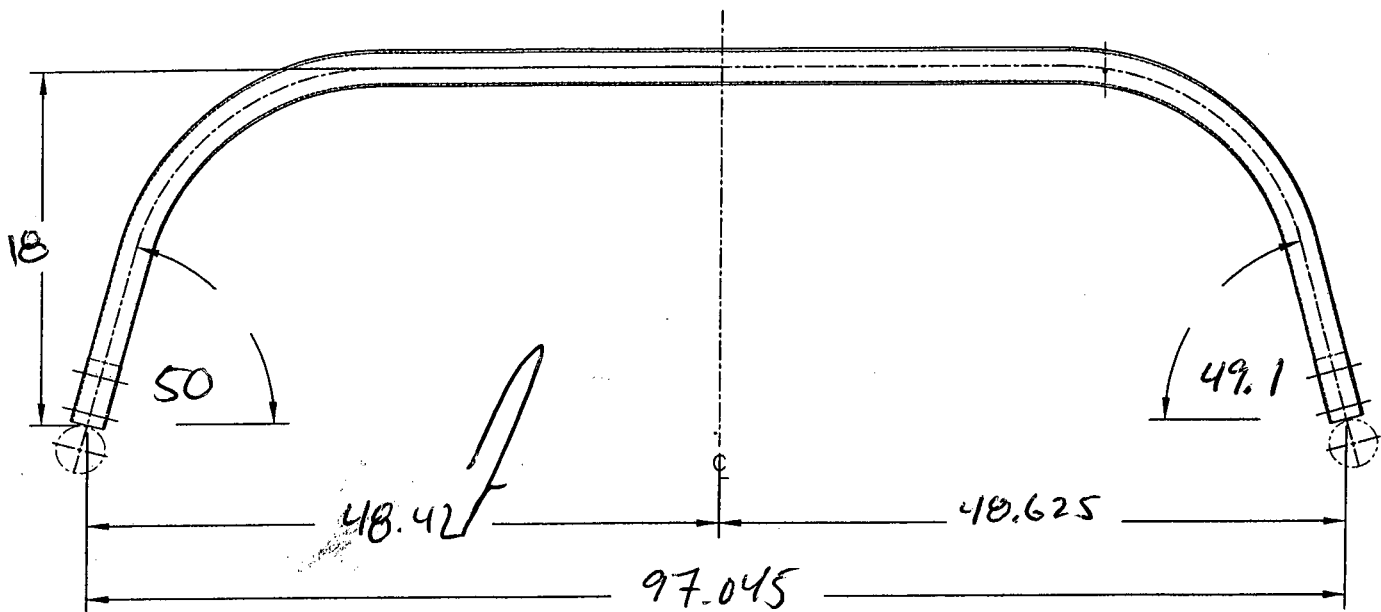
☒ First Article
 ☐ Prototype

	Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.680	± .010	2.679	✓			
	2.680	± .005 - .000	2.684	✓			
	2.687	"	2.690	✓			
	2.793	"	2.797	✓			
	2.930	"	2.934	✓			
	3.067	"	3.071	✓			
	3.205	"	3.207	✓			
	3.358	"	3.359	✓			
SIDE B	127.82"	± .020"	127.810"	✓			
	2.680	± .010	2.679	✓			
	2.680	± .005 - .000	2.684	✓			
	2.687	"	2.690	✓			
	2.793	"	2.797	✓			
	2.930	"	2.934	✓			
	3.067	"	3.071	✓			
	3.205	"	3.209	✓			
	3.358	"	3.359	✓			

Measured by:	BC	Audited by:	amf	Prototype Approval:	N/A
Date:	05.01.20	Date:	08/01/21	Date:	N/A
Rev	Date	Change	Revised by	Approved	
A		New Issue (P/O D212-664-209)	KJ/EC/DD		

DART AEROSPACE LTD		Work Order:	36769
Description: Crosstube Low Aft (412)		Part Number:	D212-664-209
Inspection Dwg: D212-664-249 Rev: A		Page 1 of 1	

Required Dimension	Min	Max
Height	17.78	18.04
1/2 Span	48.55	48.81
Angle	49	5
Total Span	97.1	97.62



Comments

QC15 Inspection	ASIA12
Date	08-01-24

Rev	Date	Change	Revised by	Approved
A		New Issue		

PARTS LIST:

Qty	Part Number	Description
X	D412-664-249	CROSSTUBE ASSEMBLY (412 LOW AFT)
1	D6009-129	CROSSTUBE
2	D2856-600-1009	ABRASION STRIP
1	D2896-1	SUPPORT
2	D3189-1	CHAFING SHIELD
2	D3595-063-570	RUBBER CUSHION
2	D3660-1	CUFF
44	CR3212-4-07	RIVET (OR M7885/3-4-07)
4	MS21920-28	CLAMP
2	MS21920-30	CLAMP (OR MS21920-32)
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)
A/R	SIKAFLEX-241/-291	SEALANT (OR PROSEAL 890 OR MIL-S-8802 CLASS B2 SEALANT)

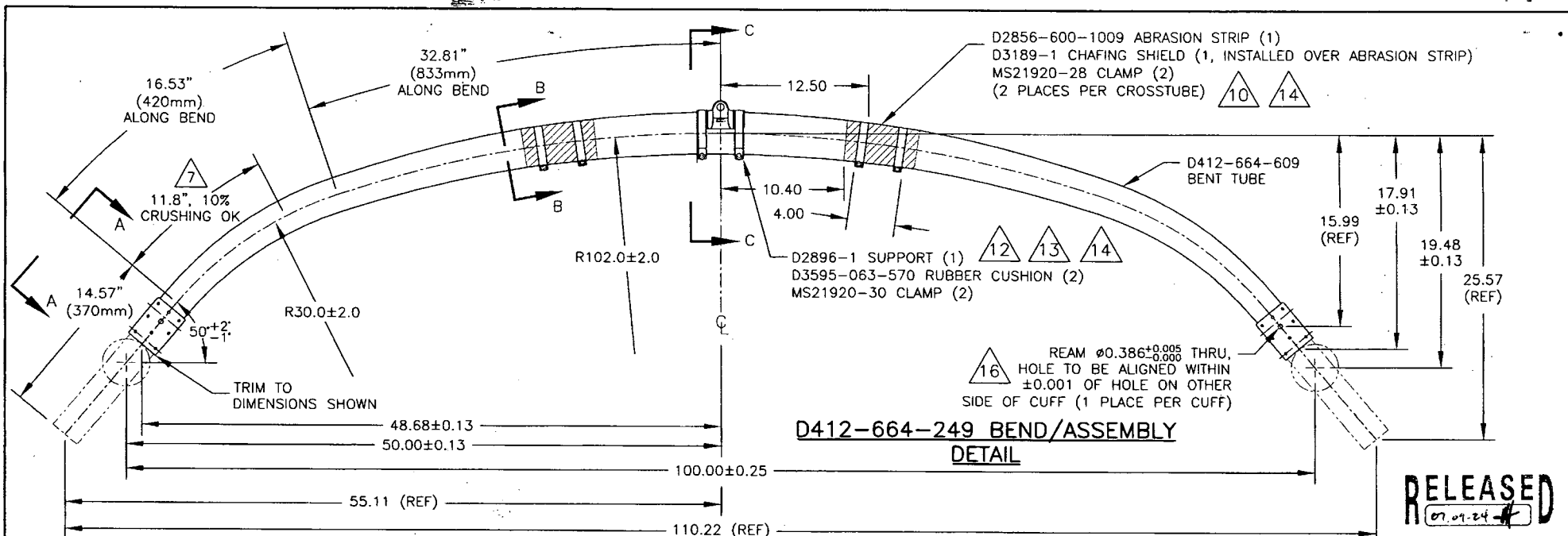
GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6009-129
FINISHED LENGTH = 127.82±0.020 (BEFORE BENDING/TRIMMING)
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) ALL DIMENSIONS ARE IN INCHES
- 5) PART IS SYMMETRIC ABOUT CENTERLINE.
- 6) WHEN MACHINING TAPER, RUN-OFF PART AT STOCK. BLEND OUT EDGE LONGITUDINALLY,
TRANSITION SHOULD BE SMOOTH.
- 7) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE
TO BENDING IS 6% BASED ON O.D., EXCEPT UP TO 10% IS ALLOWED IN AREA NOTED.
- 8) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 9) SCRIBE DART PART NUMBER AND BATCH NUMBER ON INNER SURFACE OF TUBE WITH A
VIBRATING STYLUS.
- 10) INSTALL D2856-600-1009 ABRASION STRIP WITH A 0.13 (REF) GAP ON BOTTOM SIDE OF
CROSSTUBE PER QSI 035.
- 11) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS
SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT
LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 12) APPLY A 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1
THAT WILL BE IN CONTACT WITH THE CROSSTUBE. LET CURE FOR 12 HOURS AFTER
INSTALLATION AND PRIOR TO PACKAGING.
- 13) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE
D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE
CROSSTUBE SUPPORT.
- 14) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY
AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) INSTALL D3660-1 CUFF AFTER CHEMICAL CONVERSION COAT BUT BEFORE PAINT, WITH A
LAYER OF SIKAFLEX-241/-291 OR PROSEAL 890 OR MIL-S-8802 CLASS B2 SEALANT BETWEEN
CUFF AND CROSSTUBE. SEAL EDGE OF CUFF TO ENSURE NO GAPS.
- 16) TOUCH-UP HOLES WITH CHEMICAL CONVERSION COAT.

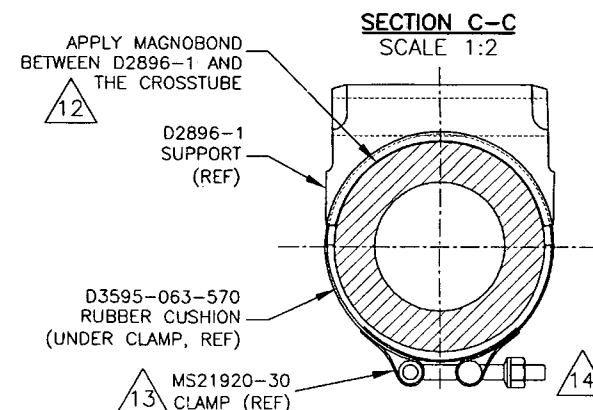
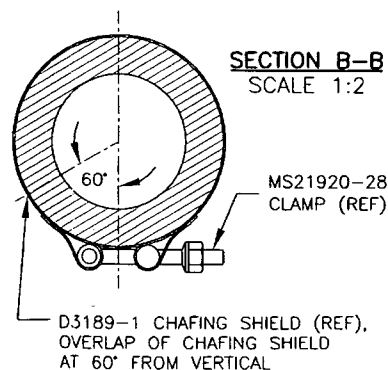
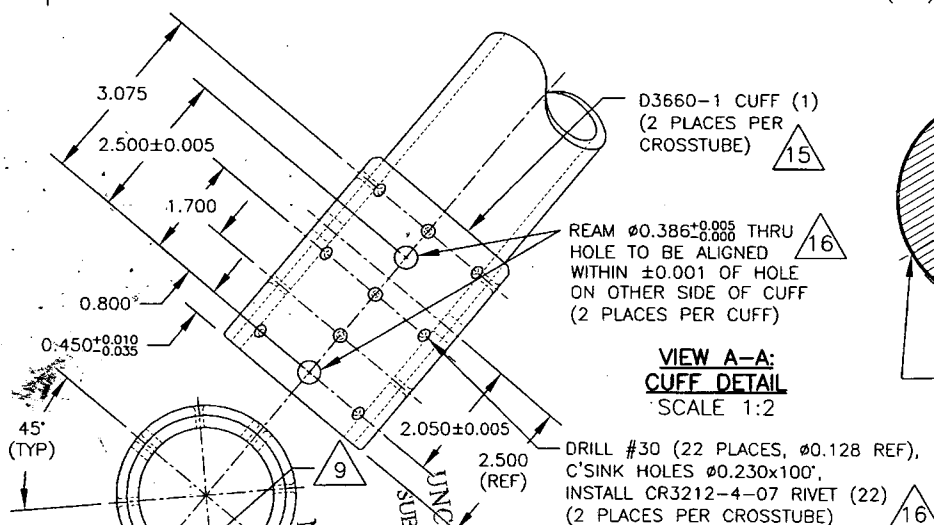
RELEASED
07.01.24-4

NO. 36769
WORK ORDER
SUBJECT TO AMENDMENT
WITHOUT NOTICE
UNCONTROLLED COPY
ENGINEERING
RETURN TO
SHOP COPY

A	07.07.07	NEW ISSUE
DESIGN	gp	DRAWN BY gp
CHECKED	mt	APPROVED
DATE	07.07.07	
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DART AEROSPACE LTD. HAMPSHIRE, ONTARIO, CANADA		
DRAWING NO. 0412-664-249		REV. A
TITLE CROSSTUBE (412 LOW AFT)		SHEET 1 OF 3
		SCALE
		NTS



RELEASED
07.07.24



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CHECKED	24	APPROVED	24		HAWKESBURY, ONTARIO, CANADA
DATE	07.07.07	DRAWING NO.	0412-664-249	REV. A	
		TITLE	CROSSTUBE (412 LOW AFT)	SHEET 2 OF 3	
				SCALE	1:8

NO. 36263

WORK ORDER

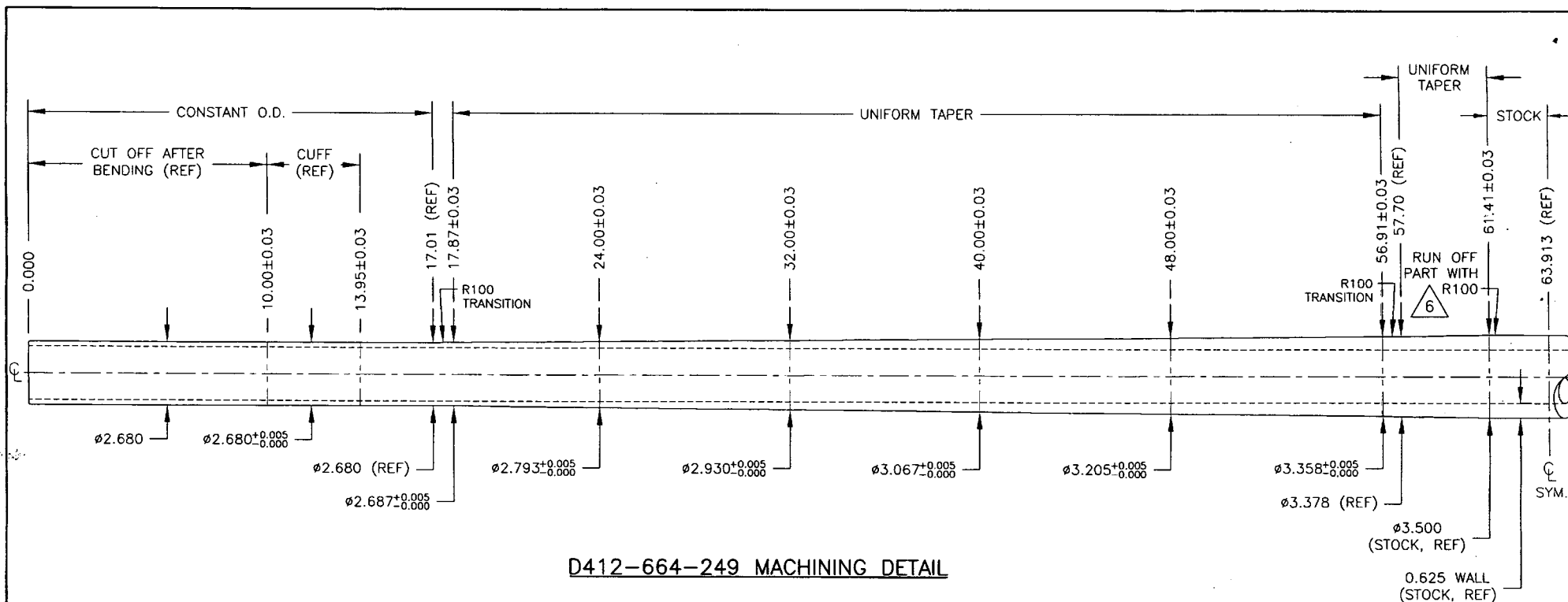
SUBJECT TO AMENDMENT WITHOUT NOTICE

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D412-664-249 MACHINING DETAIL

RELEASED
07.09.24

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SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 36729

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		DATE 07.07.07	DRAWING NO. D412-664-249	REV. A	
			TITLE CROSSTUBE (412 LOW AFT)	SHEET 3 OF 3	
				SCALE	
				1:4	



LIQUID PENETRANT TEST REPORT

P- 09829

PAGE 1 OF 1

TIME AM ☐ PM ☐

CLIENT

ATTENTION

ADDRESS

PROJECT

ITEM(S) EXAMINED

DATE

ACUREN JOB NO.

PO/NO.

WORK LOCATION

ACCEPTANCE STD.

Feb 01 2008

Hawkesbury

ASTM 1417/AS1-03a

REV./DATE 2005

JOB DESCRIPTION

PROCEDURE No. LT-0002 REV./DATE

TECHNIQUE No. LT-0000 REV./DATE

PART NO.

SCOPE

THICKNESS

D212664147, D206667103, D41264209 MATERIAL
WET FLOURESCENT LIQUID PENETRANT INSPECTION CARRIED OUT ON 100%
OF EXTERNAL SURFACE

TEST DETAILS

METHOD

FAMILY BRAND

PENETRANT

PENETRANT REMOVER

DEVELOPER

DEVELOPER TYPE

☒ FLUORESCENT

☐ VISIBLE

MAGNAFLUX

MINIMUM DWELL TIME

MINIMUM DRY TIME

MINIMUM DWELL TIME

☒ NON AQUEOUS

☐ AQUEOUS

☐ DRY

☒ WATER WASH

☐ SOLVENT REMOVABLE

☐ POST EMULSIFIED

BLACK LIGHT S/N

LIGHTING EQUIP.

OTHER

LIGHT METER S/N

☐ OUTPUT > 1000 μ W/cm²

☒ FLASHLIGHT

☐ TROUBLELIGHT

☒ OUTPUT > 100 fc @ SURFACE

CAL DUE DATE MAR 08

TEST SURFACE

SURFACE CONDITION

SURFACE TEMPERATURE

☒ AS GROUND

☐ AS WELDED

☐ MACHINED

☐ SHOT BLASTED

☒ 10°C/50°F TO 52°C/125°F

☐ CLEAN BARE METAL

☐ > 52°C/125°F

RESULTS-

(☐ METRIC ☐ IMPERIAL)

TEMP	REMARKS	ACCEPT	REJECT
34637	: ACCEPTABLE		
36377	: ACCEPTABLE		
36769	: ACCEPTABLE		
36771	: ACCEPTABLE		

Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE

TECHNICIAN (SIGNATURE):

NAME (PRINT):

FREDERICK CHAGNON

CGSB LEVEL

CGSB REG. No

SNT LEVEL

10560

CGSB LEVEL

CGSB REG. No

2ND TECHNICIAN

SNT LEVEL

DTR #

REPORT

REVIEWED BY:

NAME

INITIALS

WHITE - CLIENT COPY

CANARY - OFFICE COPY

PINK - TECHNICIAN COPY

GOLD - OFFICE COPY

PT Sept 2005